

A student runs an experiment testing the water loss from 2 varieties of 2 different organism groups shown below:

	Plant	Animal
Variety 1	Leaf SA = 29cm ² V = 100	Small Mammal (Mouse)
Variety 2	Leaf SA = 212cm ² V = 800	Large Mammal (Bobcat)

- Using the data, explain which plant would be expected to lose water faster.
- Describe TWO environmental factors that could cause an increase in plant water loss.
- Based on the animal descriptions, explain which mammal would lose water faster.
- For each organism group, propose a model linking a stimulus with a response to prevent water loss.
- An enzyme regulating water loss in mammals acts optimally at warm temperatures but becomes denatured after a certain temperature. Explain why this is logical in terms of natural selection and based on the molecular structure of polypeptides.

The student claims that the major metabolic process that occurs in plants is the reverse of that which happens in the animal.

- State what the metabolic processes are and write out the equations for each.
- Provide 3 reasons that refute the student's claim.
- Provide 1 piece of evidence for which process most likely evolved first.

Suppose that the mice eat plant variety 1 and variety 2 equally. There is a 3rd variety which carries an allele from each variety 1 & 2. The mice do not eat variety 3 for some unknown reason.

- Construct a food chain showing 3 different trophic levels. State how much energy flows from one level to the next.
- Describe how this food chain could be converted to a food web and what organism is missing which would allow for this.
- If the variety 1 phenotype represents 36% of the population and is considered a recessive phenotype, calculate the frequency of plants that would survive best in this population.
- State the 5 conditions necessary for the population frequencies to remain in equilibrium.

Suppose a virus attacks the bobcat population, affecting their production of Helper T-cells.

- Explain how their Innate vs. Acquired immune responses will be affected and a specific example of each.
- Explain how this virus will impact the community dynamics overall.